



# **Simulation Based Acquisition**

## **Re-Engineering Acquisition For 2005 and Beyond**

**Briefer: Col Phil Faye  
Office: ESC/CXC  
DSN 478-3234  
Date: 13 Dec 00**



# Overview

AFMC SBA



- **What is SBA?**
- **AFMC SBA Infrastructure Office (ASIO) Status and Road Ahead**
- **Joint Synthetic Battlespace**



# What is SBA?

AFMC SBA

## SBA is the Enabler For:

- Operational Safety, Suitability & Effectiveness (OSS&E)
- Cross-Center Integration of Weapon Systems
- Capabilities Based Requirements
- Developmental Planning
- Simulation Based R&D

***Re-Engineering AFMC To Meet the Challenges  
of Joint Vision 2010 & 2020***



# Simulation Based Acquisition

*AFMC SBA*

## **AFMC Definition of Simulation Based Acquisition**

- ♦ Government and Industry Working Together to Enhance the Effectiveness and Efficiency of Weapon System Acquisition Through More Effective Use of Modeling, Simulation, & Analysis (MS&A), Information Technology, and Process Improvements.
- ♦ Simulation Based Acquisition Is an Enabler for Improving the Cycle Time and Costs of Fielding Needed Capability by Better Integrating the Warfighter and Technologist into the Acquisition Process and Verifying the Warfighters Requirements and Emerging Technologies.
- ♦ It Is a Development Process Based on Virtual Models & Simulations ("Virtual Test") Validated by Physical Models & Test



# SBA Infrastructure Constructs

AFMC SBA

## “People Interoperability”

### Collaborative Environment -- CE

- Stakeholders conferencing within and across many sites
- Supports Integrated Desktop & Simulation collaborations

## “Data Interoperability”

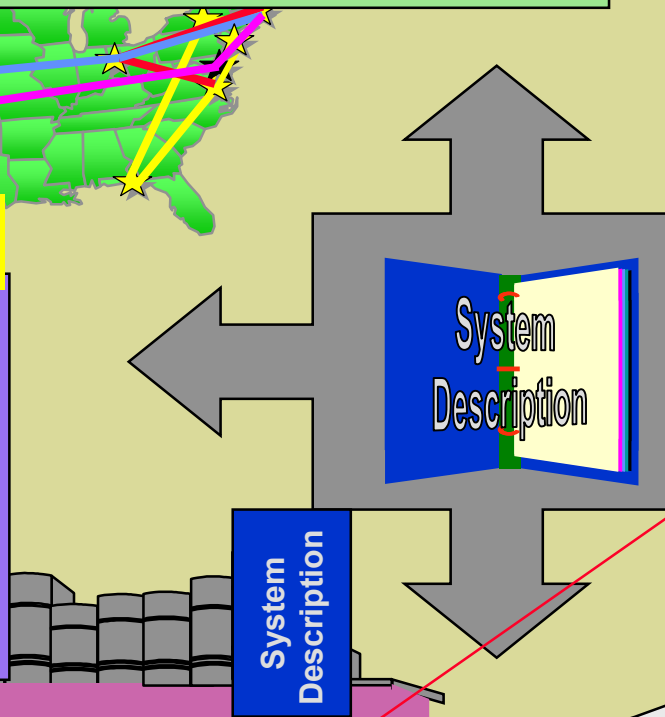
### Common Data Environment -- DPD & DIF

- Authorized stakeholder can push/pull and manipulate desired system description data

## “Tools Interoperability”

### Open Architecture – DIF and DIRR

- Stakeholders use own tools
- Standard interfaces allow access to many databases
- Information-centric



*Creates Lifecycle Interoperability Across the Product Lines*



# SIMULATION BASED ACQUISITION COLLABORATIVE ENVIRONMENTS

AFMC SBA

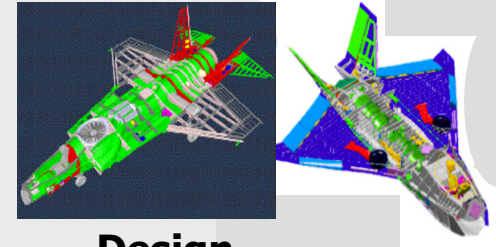


**Logistics  
Environment**

**Synthetic  
Battlespace**

## Distributed Product Description (DPDs)

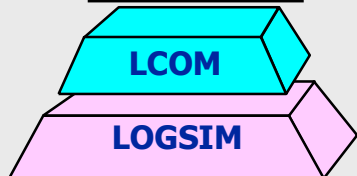
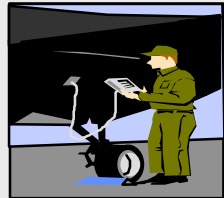
- Architecture Models
- Digital Sys Models
- Requirements
- Cost/Schedule
- Logistics
- ....
- ....



**Design  
Engineering**

Collaborative Environment Partnership  
**Government and Industry**

**Virtual  
Manufacturing**



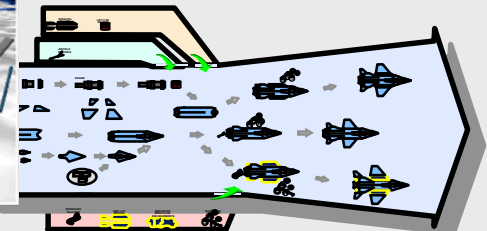
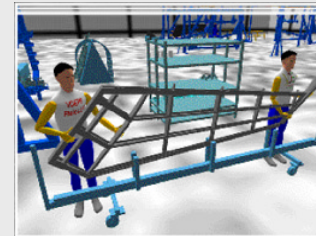
## Acquisition Management

Collaborative  
Communication Tools



Workflow, Product &  
Process Modeling

Decision Support



**“an Enabler for Improving the Cycle Time and Costs of Fielding Needed Capability by Better Integrating the Warfighter and Technologist into the Acquisition Process...”** *HQ AFMC*



# SBA History

*AFMC SBA*

- 1995** • M&S 4 Star Summit
  - Established Vision for M&S
- 1996** • Study on the Effectiveness of Modeling & Simulation in the Weapon System Acquisition Process
  - First Use of the Term SBA
- 1997** • Industry Steering Group (ISG) Established to Advise Government and Industry on SBA
  - Works Thru OSD Acquisition Council
- AQ Policy Letter (Mr Money Memo)
  - Directed Programs to Develop Digital System Models
- 1998** • Government - Industry Conferences
  - Published ISG Report on SBA
- 1999** • AFMC “SBA” Tiger Team Formed
- 2000** • AFMC Tiger Team Reports Out
  - Center CC’s Endorse Way Ahead for Infrastructure
- AFI 16-1002 M&S Support to Acquisition Published
  - Formalizes Building DPD’s & M&S SP’s



# SBA Benefits

*AFMC SBA*

- ♦ **Improves Integration and Interoperability**
- ♦ **Helps Implement CAIV over the Lifecycle**
- ♦ **Immerses the User & Testers** in the Development Process
- ♦ **Gets the Right Information** to the Decision Makers
- ♦ **Improves Technology Integration**
- ♦ **Identifies and Fixes** Design Problems Early
- ♦ **Improves** Risk Management
- ♦ **Improves** Test Effectiveness
- ♦ **Reduces** Scrap and Rework
- ♦ **Enabler and Foundation for OSS&E**





# Overview

AFMC SBA

- **What is SBA?**
- ➔ • **AFMC SBA Infrastructure Office (ASIO) Status and Road Ahead**
- **Joint Synthetic Battlespace**



# SBA REQUIREMENTS FOR 2005

Threshold Requirements Established at 24 Jan 00 CCs Conf  
AFMC SBA

- ♦ **Integrate Activities at the Multi-Command, Multi-Center, and Multi-Program Level**
  - ♦ **Threshold: Integrate Across Four Product Lines and 20 Programs**
- ♦ **Develop a Tool Set That Allows Decision Makers to Identify, Assess and Validate Trade Off Options**
  - ♦ **Threshold: Operational Capability/Cost Effectiveness Assessments for Threshold Programs**
- ♦ **Supports Reduced Acquisition Cycle Time**
  - ♦ **Threshold: 25%**
- ♦ **Supports Reduced Total Ownership cost**
  - ♦ **Threshold: 10%**

***The Vision Is An Integrated AFMC SBA Infrastructure that Improves the AF's Ability to Satisfy Desired Operational Capabilities***



# SBA Infrastructure Team Formed

*AFMC SBA*

- ♦ AFMC/CV Ltr, 7 Feb 00: Directed ESC to Be the Lead Center For AFMC Simulation Based Acquisition (SBA) Infrastructure
  - ♦ Tasked ESC Stand Up AFMC SBA Infrastructure Office (ASIO) by FY 02
  
- ♦ ASIO Cadre established at ESC in Spring 00
  - ♦ Created Command-Wide IPT
  - ♦ Developed and Coordinated Program Approach
  
- ♦ AFMC/DR Ltr, 15 Jun 00: Provided a List of Design Requirements for the SBA Infrastructure
  
- ♦ ESC/CC: Brief all AFMC CCs prior to AFMC CC Conference
  - ♦ Coordinate Way Ahead
  - ♦ Gain Buy-In to SBA Concept



# Briefed To Date

*AFMC SBA*

- |                            |              |
|----------------------------|--------------|
| ♦ Lt Gen Tattini           | SMC          |
| ♦ Dr Russo                 | ASC          |
| ♦ Maj Gen Johnson          | OC-ALC       |
| ♦ Maj Gen Bergren          | OO-ALC       |
| ♦ Maj Gen Kostelnik        | AAC          |
| ♦ AFMC Staff               | DR/EN        |
| ♦ Gen Lyles & Gen Coolidge | AFMC/CC & CV |
| ♦ Brig Gen Nielsen         | AFRL         |
| ♦ Maj Gen Haines           | WR-ALC       |

## **Still to Brief**

Maj Gen Reynolds

AFFTC

Dec 00



# Results of Briefings & Team Meetings To Date

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*AFMC SBA*

- ♦ Endorse Approach And Planning Effort
- ♦ Should Be A Corporate Infrastructure Investment
- ♦ Apply It Across the Weapon System Lifecycle and Acquisition Business Process

# Strategy to Evolve SBA Infrastructure

AFMC SBA

- Maximum Use of Off-the-Shelf Products
  - Provide seed money to influence industry support of unique AF/DoD requirements
- Use a Distributed IPPD Process to Facilitate User, AFMC and Industry-wide SBA Collaboration
- Capitalize on Current Efforts & Expertise at Different Centers
  - Acquisition Centers
  - Test Centers
  - Labs
  - Logistics Centers
- Apply to Real Programs

***Phased Approach – Walk Before We Run To Integrate & Field Low-risk, Value-added, Usable, USED Capability***



# SBA Infrastructure Requirements Refinement Process

AFMC SBA

- ♦ Action For AFMC SBA Infrastructure IPT

Nov 00



Dec 01

- ♦ Baseline Existing Infrastructure
- ♦ Develop an AFMC SBA CONOPS
- ♦ Finalize Initial Candidate Programs
  - ♦ Span as Much of the Acquisition Lifecycle & As Many Communities as Possible
  - ♦ Evaluate Injection of SBA Infrastructure Elements
- ♦ Initiate Pilot Programs
- ♦ Gather Data on Use of the SBA Infrastructure in Pilots
- ♦ Analyze Data Gathered/Extract Requirements and Capabilities
- ♦ Define Infrastructure Roadmap and Phases for Implementation



# Cultural Change – A Way Ahead

AFMC SBA

- ♦ Develop Overall SBA CONOPS
- ♦ Lead by Example – Build an SBA Primer
  - ♦ Educate the leadership on the Tenets of SBA
  - ♦ Learning to Ask the Right Questions
- ♦ Educate the Work Force Through Example and Training
  - ♦ Quick Successes will Tell the Story
  - ♦ Develop Common Briefing for Users, Centers, AFRL and Industry on roles and responsibilities
- ♦ Educate the School Houses
  - ♦ DSMC
  - ♦ AFIT

*We Need a Key Demonstration that Integrates All The Centers in a Common View of How to Use SBA in New Acquisition Model*





# SBA Infrastructure Challenges

AFMC SBA

- ♦ Information Assurance and Collaboration Environment
- ♦ Joint Synthetic Battlespace – Required to make SBA a reality
- ♦ Data Interoperability
- ♦ Funding

***We Are Prepared to Move Out With  
AFMC/CC Endorsement***



# **JOINT SYNTHETIC BATTLESPACE (JSB) CONCEPT & SIMULATION BASED ACQUISITION (SBA)**

**Briefer: Col Phil Faye**

**Office: ESC/CXC**

**DSN 478-3234**

**Date: 13 Dec 00**



# Overview

*AFMC SBA*

## JSB Concept

- ♦ Briefing Highlights
- ♦ Planning & Challenges
- ♦ Summary



# Briefing to COMACC

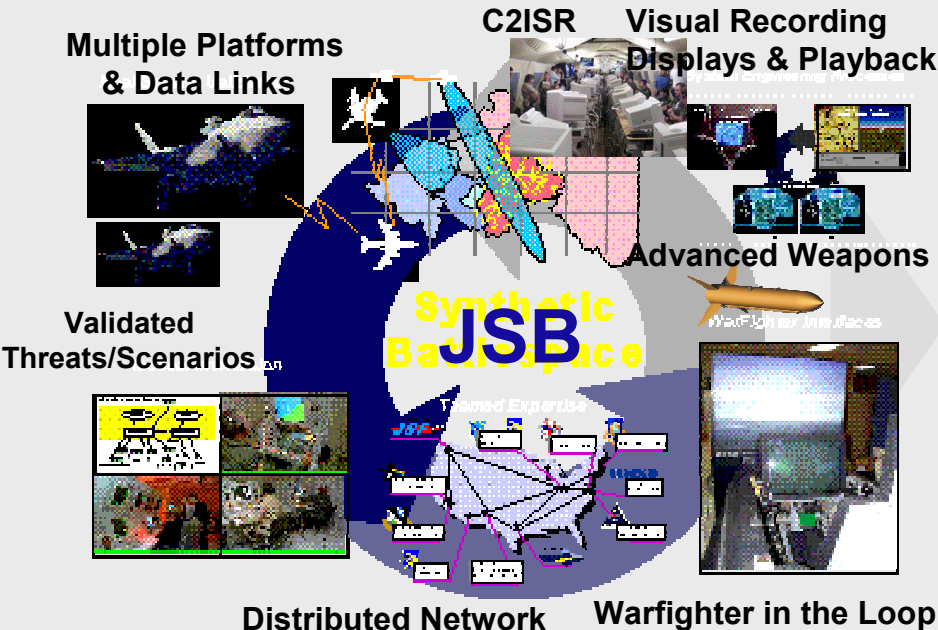
*AFMC SBA*

- ♦ **Based on JSB Briefing to Maj Gen Perryman, ESC/CXC Invited to Brief Gen Jumper on 3 Nov 00 During M&S Focus Session**
- ♦ **Key Attendees Included Representatives From AF/XOC, AFAMS, C2TIG, ESC, and COMACC Staff**
- ♦ **General Jumper Endorsed JSB Concept and Stated He and General Lyles Should Lead**



# Joint Synthetic Battlespace Enables the New Acquisition Model as a Key Element of SBA

AFMC SBA



## WHY?

- Tactical and Analytical Realism
- WarFighter/Developer Collaboration
- Real System Interfaces (HWIL/SWIL)
- Try before you Buy
- Debug before you Fly
- Discover Operational Deficiencies Early
- Improved Insight to Operational Trades
- Demonstrate Large Scale Exercises
- Essential for Interoperability Testing
- Systems of Systems approach to Multi-Service (DoD) Total Weapon System Effectiveness
- True Industry/Government Partnership

## Quicker Fielding

*Avoid Redesign/Mistakes*

## Cost Avoidance

*Total Weapon System Savings*

## Improved Product

*Better System Design & Operator Interfaces*

**Levels Playing Field Across the Industry-Government Enterprise**

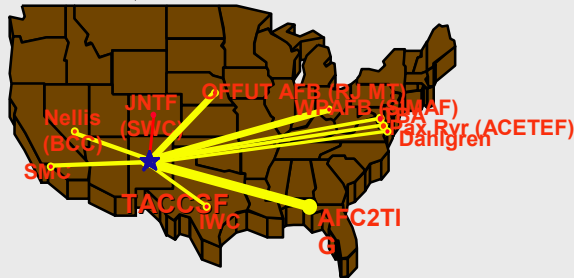


# Warfighter & Acquisition Community Partnership

AFMC SBA

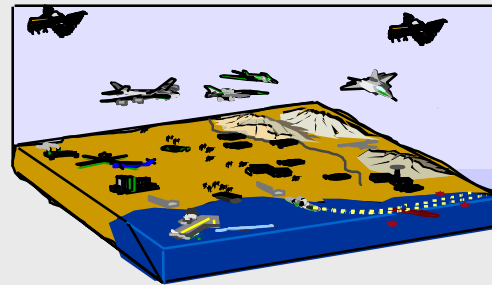
- ♦ Warfighter Develops Mission & Scenarios (Strategic, Operational, Tactical Levels of War)
- ♦ AFMC Role is to Systems Engineer the Environment and Networks Using Instituted Processes
  - Model and Database Development
  - Configuration Management
  - Validation and Verification
  - Government – Industry Interchange Meetings

## WARFIGHTER



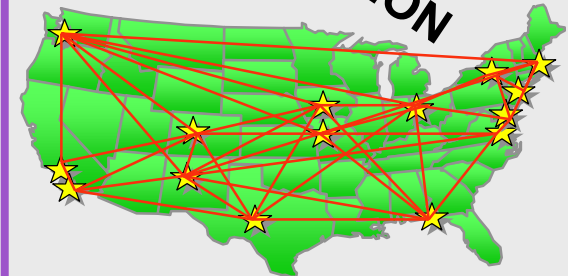
- TRAINING
- MISSION REHEARSAL

## Joint Synthetic Battlespace



- REQUIREMENTS
- EXPERIMENTATION
- OPERATIONAL TESTS

## ACQUISITION



- TECHNOLOGY
- DESIGN TRADES
- SYSTEMS ENGINEERING
- INTEGRATION
- DEVELOPMENT TESTING

**Both Communities Provide Key Facilities For Distributed Operations**



# MULTIPLE VIEWS-SCALABLE FIDELITY ACROSS MANY SCENARIOS OVER TIME

AFMC SBA

CHANGING VIEWS OVER TIME

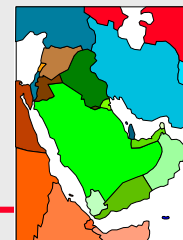
Present +15  
Technology  
Assessment

Present +10 yrs  
Concept Exploration,  
Requirements

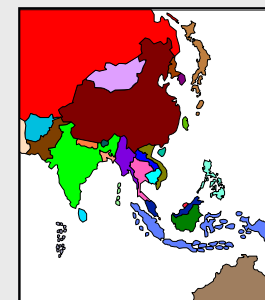
Present + 5 yrs  
Development, Test

PRESENT  
Training,  
Rehearsal

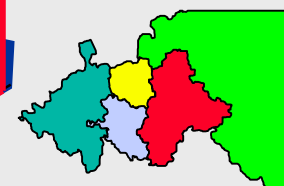
South West Asia Scenario



North East Asia  
Scenario



Composite Scenario



MOOTW, TEST RANGE  
& NUMEROUS OTHER  
SCENARIOS/VIGNETTES

WARFIGHTER ACQUISITION

OPERATIONAL

TACTICAL

**Warfighter-Developer Teaming  
Systems Engineering, Integration, Testing & Fielding  
As A Government-Industry Enterprise**



# Overview

*AFMC SBA*

- ♦ **JSB Concept**

-  **Briefing Highlights**

- ♦ **Planning & Challenges**

- ♦ **Summary**





# Key Tenets of JSB

*AFMC SBA*

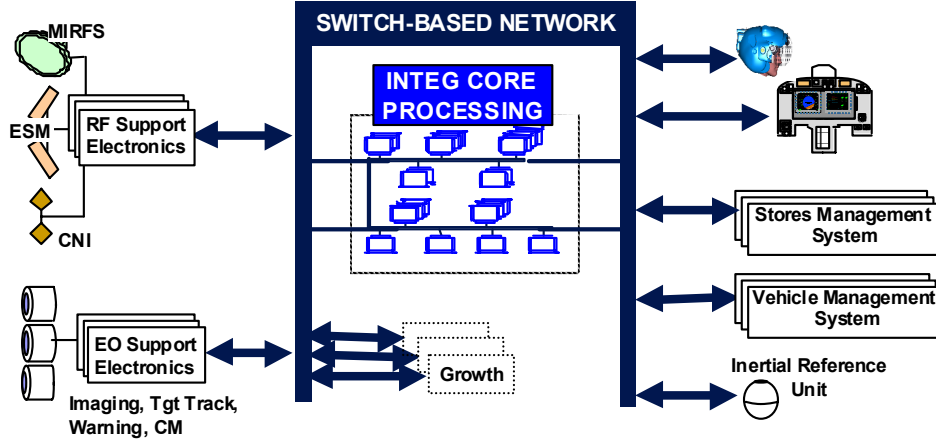
- ♦ **Complex Systems Require Higher Fidelity Simulation Environments for Systems Engineering With Warfighters**
- ♦ **Common Architecture Required to Support Weapon System Life Cycle and Enable “Capabilities Based Requirements”**
- ♦ **Systems Engineered Solution is Required**
- ♦ **JSB Supports Corona Top Five Capabilities**
- ♦ **ESC Working Across AFMC With Industry, AFAMS, XOC, and AC2ISR to Develop CONOPS, Acquisition Strategy, and Fall '01 Demonstration Plan**



# Complex Systems

AFMC SBA

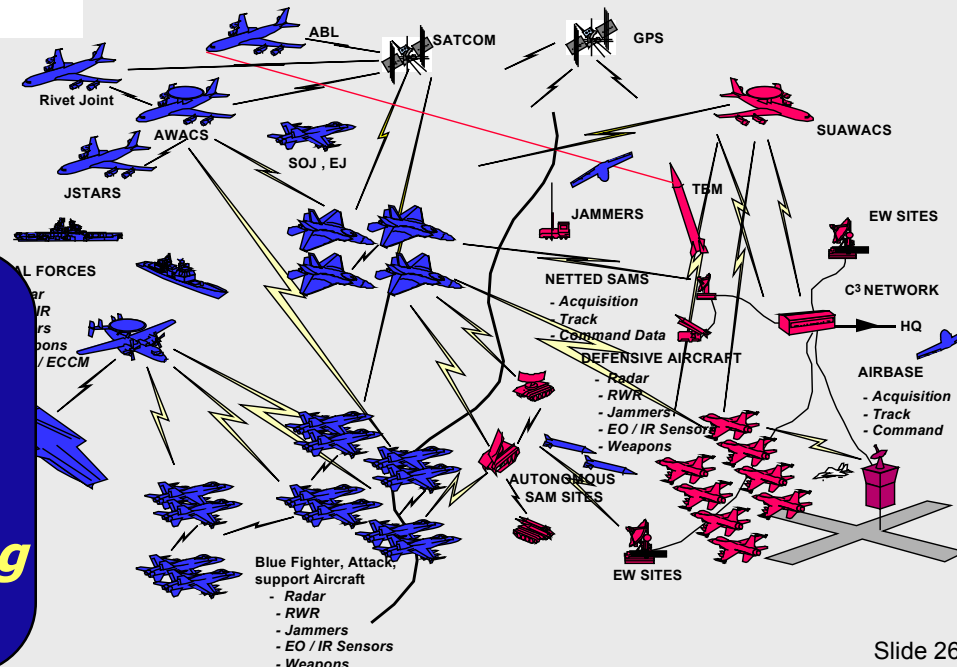
Several Million Lines of Code



**Complex  
Integrated  
Avionics**

**Greater Weapon System  
& Battlespace Complexity  
Demands An SBA Approach --  
A Joint Synthetic Battlespace  
Supporting the Systems Engineering  
Process Is Required**

**Multi-Spectral  
Information  
Battlespace**





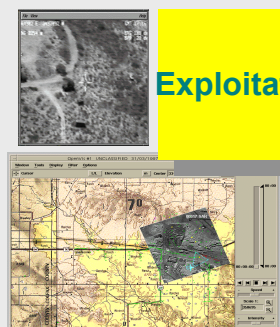
# Higher-Fidelity Simulation Environment Enables More Detailed Assessments

AFMC SBA

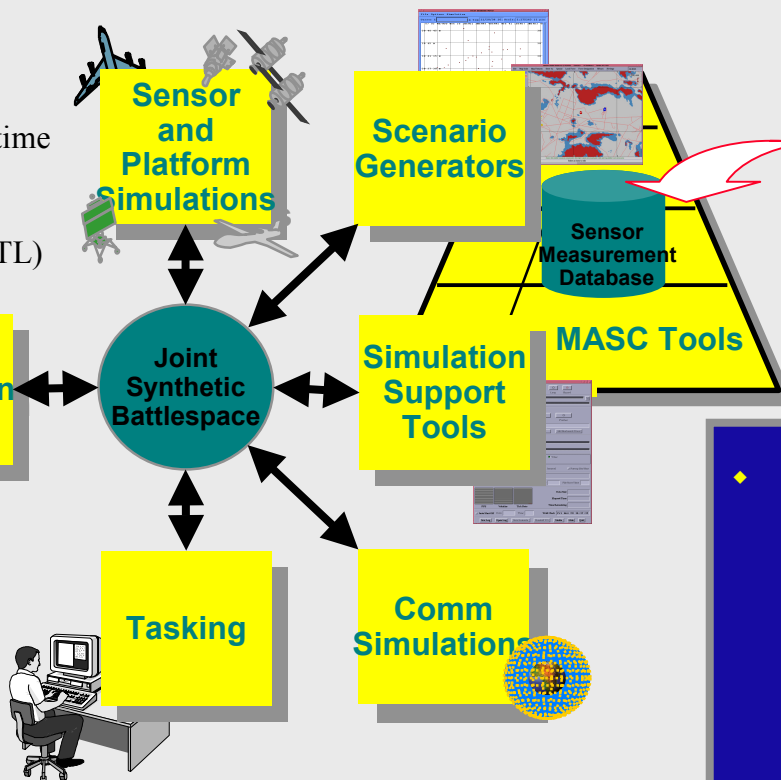
Leveraging ESC, AFRL, Army CECOM, Navy Strike Cell/SPAWAR, OSD (CAESAR), NRO, DARPA, MITRE, ASC, Battelabs, industry and classified resources

## High fidelity M&S capability

- Real-time & non-real-time simulations
- Software/hardware/operator in the loop (OITL)



**GMTI  
Testbed**



- ♦ Engineering-level analyses
  - Relative sensor capabilities & limitations
  - Correlation, tracking, fusion, CID, data communications
  - Network configuration options, loading and mitigation
  - Kill chain component contributions
  - Impacts on mission-level & campaign-level effectiveness

- ♦ Representative applications:
  - Evaluate integration of space-based, manned airborne and UAV surveillance assets for the ground surveillance mission
  - Develop tasking, processing, exploitation and dissemination concepts for netted sensors
  - Determine COP and Global Grid requirements to support Platform Independent GMTI & beyond for PRECISION STRIKE WARFARE

*Support development and evaluation of integrated tasking, sensor processing, exploitation and dissemination concepts*

- Enhance CONOPS development
- Quantify system-level requirements
- Support performance evaluations



# Common Architecture Requirement Supports Weapon System Life Cycle

AFMC SBA

CONOPS

Operational  
Requirements  
Document

Performance  
Based  
Specification

System Integration  
Lab

JOINT SYNTHETIC  
BATTLESPACE

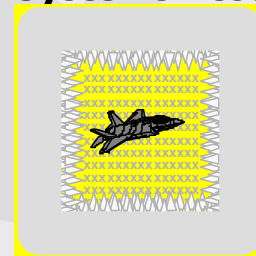
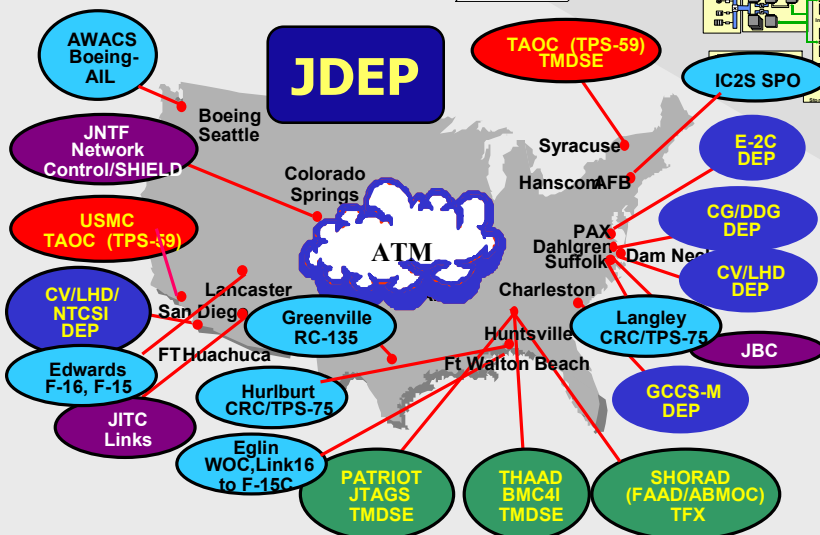
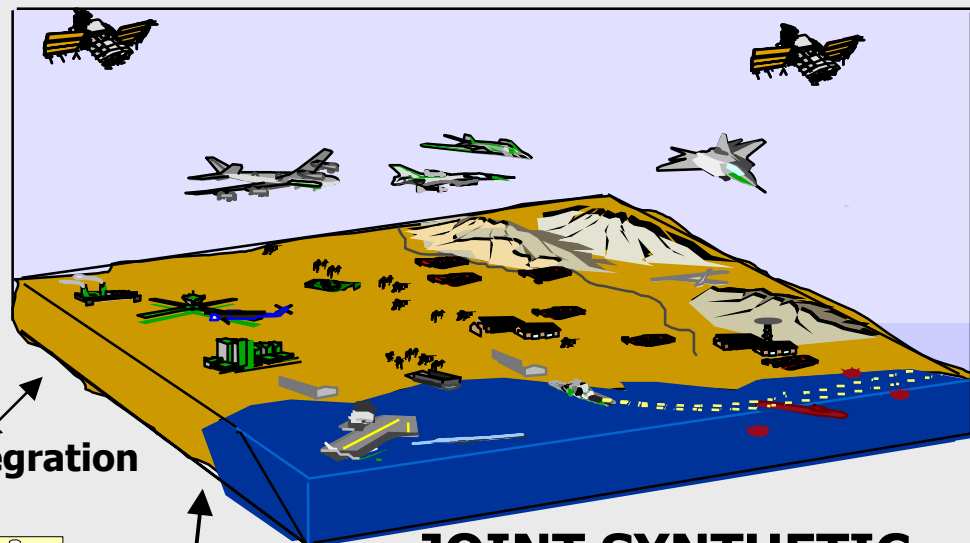
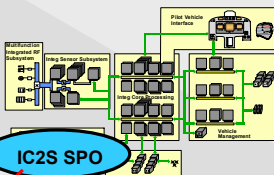
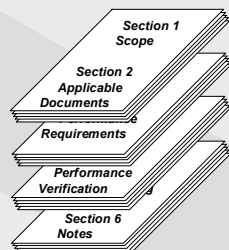
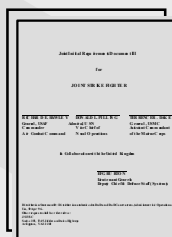
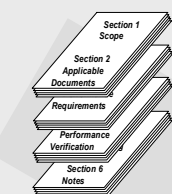
HLA Federations

Live Flight Test

Training, Mission Rehearsal

Installed  
Systems Test

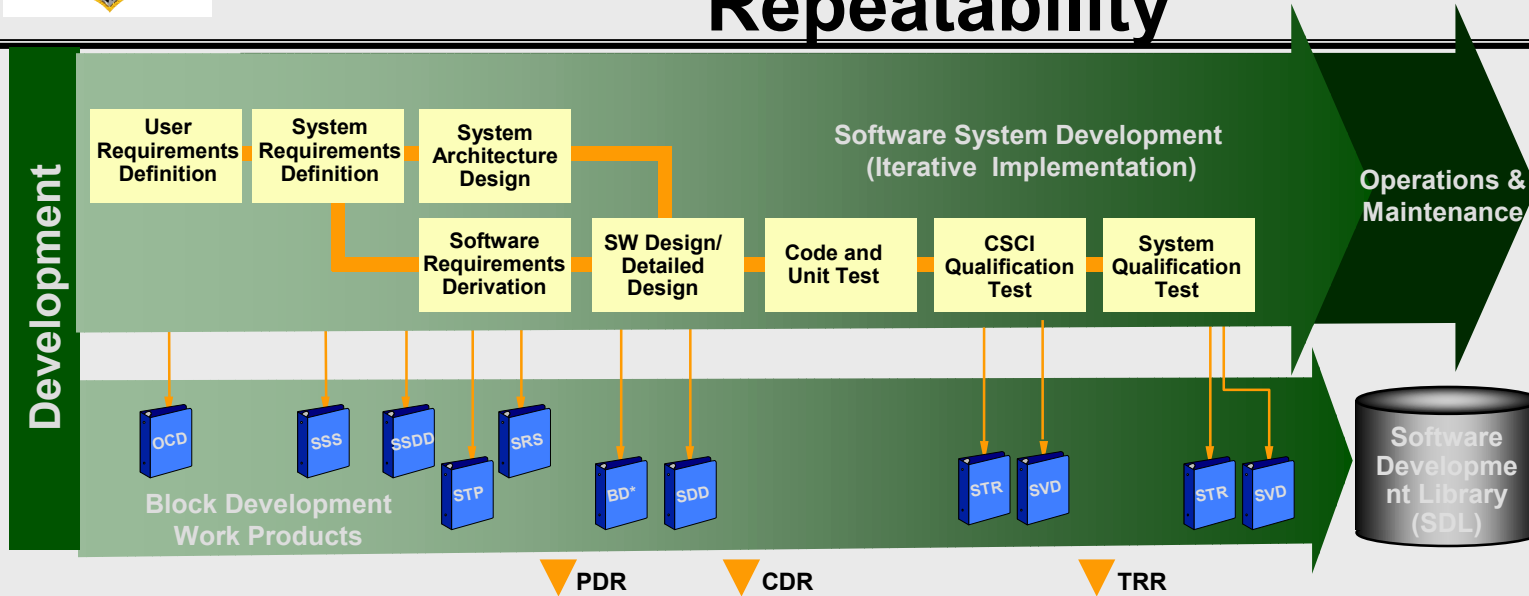
Promotes Early and Continuous  
Warfighter Involvement Throughout  
the Development Process





# Engineered Process - Ensures Standardization and Experiment Repeatability

AFMC SBA



- ♦ **System Development Process Flow**
  - ♦ Iterative/Spiral
  - ♦ Defines Activities and Products
- ♦ **User Involvement (Warfighter & Engineer)**
  - ♦ Throughout the Process
  - ♦ Includes Beta Version Assessments
- ♦ **Beta Releases**
  - ♦ Customer/User Assessment
  - ♦ Feedback for Product Improvement

**ESC Working With AFAMS, AC2ISRC, XOC  
To Provide Systems Engineering & Integration**



# USAF Top Priorities Supported by JSB

AFMC SBA

- ♦ **CORONA top five critical capabilities:**

- Collaborative C2 Centers that operate with standard rules in an assured data environment
- COP that collects and displays decision quality data like an operational radar
- Accurately Find, Fix, Track, time critical targets
- Dynamic effects-based targeting, weapon pairing and control
- Automated and timely effects-based assessment

- ♦ **AC2ISRC/CC's Top Five Priorities (AS OF SEP 00):**

- Create and Use CAOC-X
  - Web Enable All C2 Applications
  - Create JTF-SWA CAOC
  - Embrace Many Partners
- Create TCT Capability by Collaborating Jointly and Using Nellis CAOC
- Publish AF C2ISR "To Be" CONOPS and Ops Architecture
- Build Joint CONOPS and Way Ahead For The Operationalized Picture of The Battlespace
- Build a "Capability Based" AF C2ISR 03 APOM Submission

**JSB HELPS TO ENABLE CRITICAL CAPABILITIES or AC2ISRC PRIORITIES  
IN A DISCIPLINED & REPEATABLE SYNTHETIC ENVIRONMENT "TESTBED"**

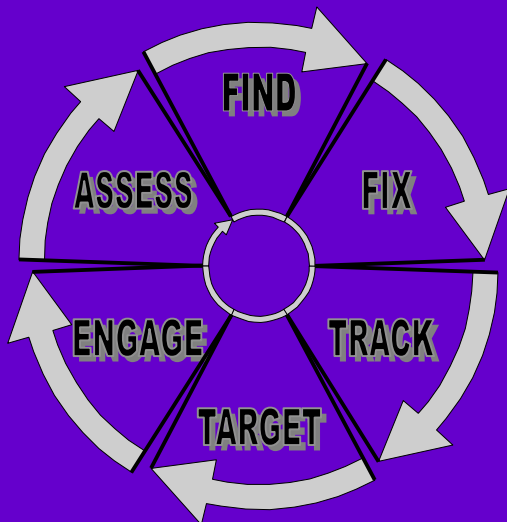
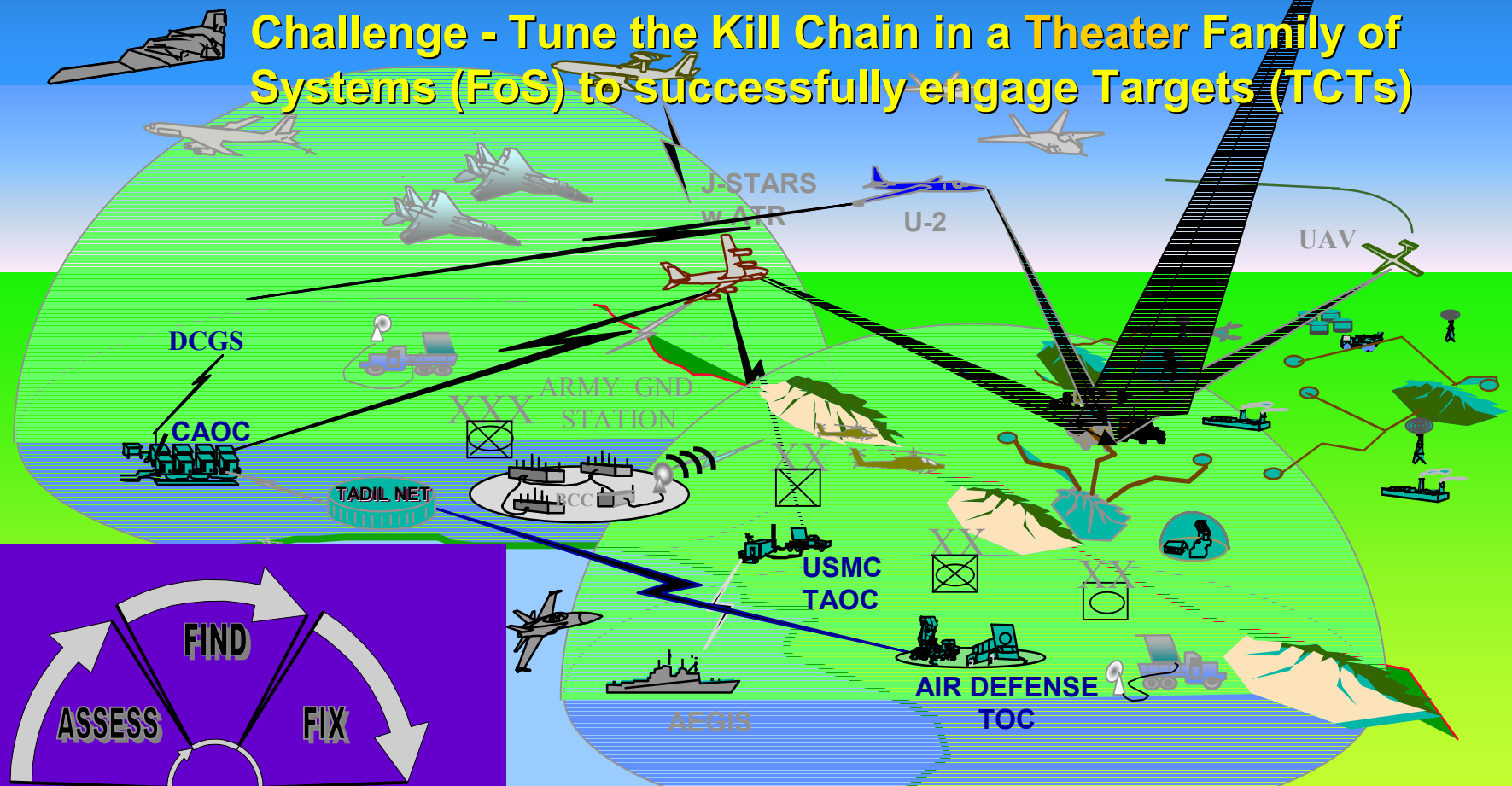




# Focus for Fall 01 Demo

## Air to Surface Time Critical Targeting

**Challenge - Tune the Kill Chain in a Theater Family of Systems (FoS) to successfully engage Targets (TCTs)**



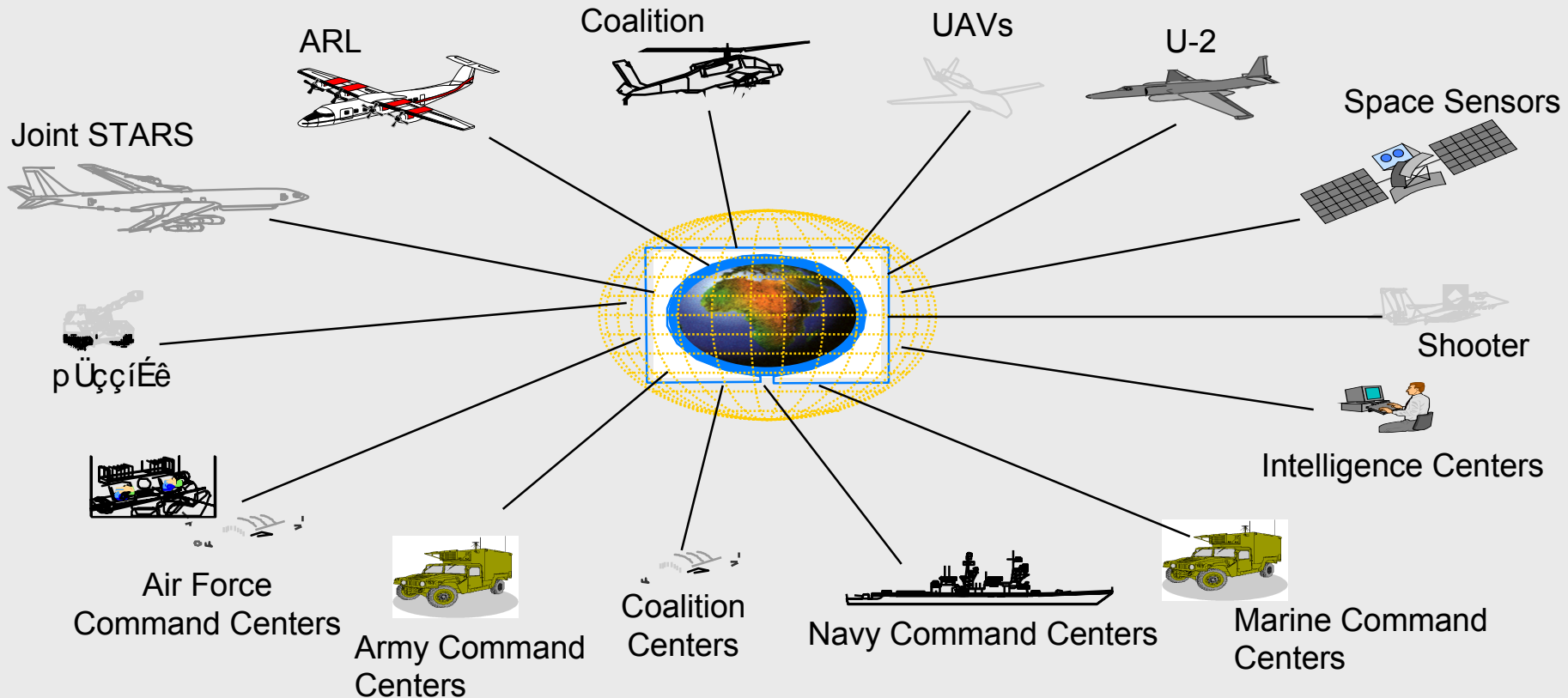
**ESC-ASC-SMC-AAC-AFRL-AFFTC  
ALL PROVIDE CENTERS OF  
EXCELLENCE TO SUPPORT JSB**



# Other Activities Benefiting From or Supporting JSB Fall 01 Demo

AFMC SBA

## Platform Independent GMTI Testbed



***Ongoing Development of GMTI Testbed Requires a Consistent, Validated and High Fidelity Representation of Sensors and C2 Processes With the Capability to Put Warfighters-in-the-Loop***





# COMACC Comments

*AFMC SBA*

- ♦ **Strongly Supports Concept of Warfighter and Engineers Collaborating in a Common Environment**
- ♦ **Simulation Allows Us to Try New Processes in a Repeatable, Realistic Environment**
- ♦ **Emphasized Need for Architecture Standards and An Architecture That is Not Proprietary**
- ♦ **Supports Distributed Training Where Operator Can Stay at Home Station**
- ♦ **Views TACCSF as Hub for Training and Providing JSB Support to ACC**
- ♦ **Need to Start With CONOPs and Think About Capabilities Needed First and Not the Solution**



# Overview

*AFMC SBA*

- ♦ **JSB Concept**
- ♦ **Briefing Highlights**
- ♦ **Planning & Challenges**
- ♦ **Summary**



# JSB Planning - Accomplishments

*AFMC SBA*

- ♦ **Conducted JSB Kickoff in September and Four Subsequent Interim Progress Reviews**
  - Participants Include XOC, AC2ISRC, AFAMS, TACCSF, JHU-APL, TRW, Raytheon, ASC, AFRL, AAC, SMC, and AFFTC
- ♦ **Developed Draft Documentation and Demonstration Objectives and Scenarios**
- ♦ **Established Government - Industry Cadre**



# JSB Planning - Next Step

*AFMC SBA*

- ♦ **Developing Draft JSB Concept of Operations**
- ♦ **ESC Hosting Industry-Government JSB Forum w/ XOC**
  - ♦ **19-21 Dec Forum at JHU-APL WALEX to gain consensus on:**
    - **JSB CONOPs**
    - **Acquisition Strategy and WBS**
    - **Fall '01 Demonstration Objectives**
- ♦ **OTHER RELATED PLANNING ACTIVITIES:**
  - ♦ **Tiger Team Being Formed by XOC**
  - ♦ **Air Force Modeling & Simulation Caucus Meeting in January**
- ♦ **RECOMMENDATION: AFMC & ACC Commanders Host Initial Planning Review During Second Quarter FY01**



# JSB Planning – Road Trip Briefings

*AFMC SBA*

- ♦ **Brief Stakeholders to Gain Feedback and Support for Concept:**
  - **Dr Garber**
  - **Dr Delaney**
  - **Mr Gilligan**
  - **XOC/XO**
  - **General Eberhart**
  - **General Robertson**
  - **Industry**



# Key Challenges

*AFMC SBA*

- ♦ **JSB Development Approach**
  - Need Integrated Concept That Supports All Stakeholders
  - Need to Demonstrate Integrated Capabilities
  - Leverage Previous Work:
    - > AFAMS/XOC JSB Ignition Events
    - > NASM/JSIMS Development Activity
- ♦ **Funding Not Programmed to Support**
  - Currently Leveraging People, Resources, and Limited XOC Funding
  - Decide We Want the Capability and Gain Resource Commitment



# Technical Challenges

*AFMC SBA*

- ♦ **Multiple Levels of Security**
- ♦ **Varying Fidelity for Broad User Base**
- ♦ **Parallel Processing**
- ♦ **Link 16 Operational Network Simulation**
- ♦ **Fidelity in Synthetic Natural Environment**
- ♦ **High Level Architecture Implementations**
- ♦ **Virtual Distributed Development Capability**



# Summary

*AFMC SBA*

- ♦ **Received AFMC/CC Concurrence on Proposed JSB Concept**
  - **Develop High Resolution JSB to Support Acquisition Needs**
  - **Promote AFMC as JSB Developer With Warfighter Community**
- ♦ **Received AFMC/CC Concurrence on Developing Investment Plan for JSB**